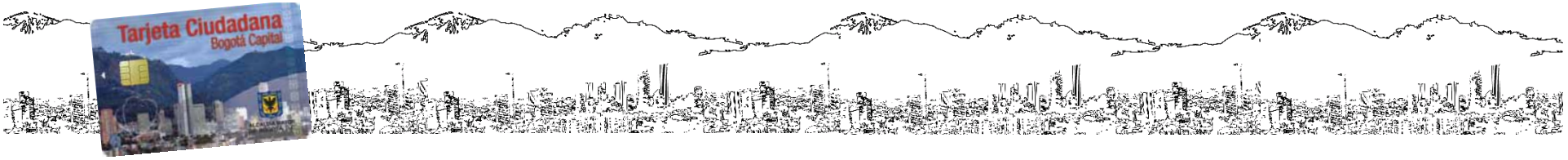


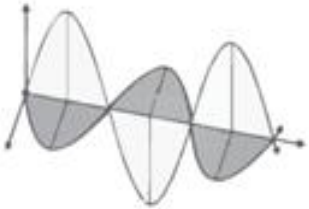
Perspectiva de la tecnología de comunicaciones RFID

Francimar Santos

Business Development Manager for Latin America

May 2009

The history of RFID



1880s: Fundamental understanding of Electromagnetic Energy

1897: Guglielmo Marconi invented the radio

1922: Birth of Radar advance thoughts around RFID technology

1950s: Early RFID technology is used in Research Labs

1937: NRL developed the IFF System

1958: Jack Kilby invents the integrated circuit

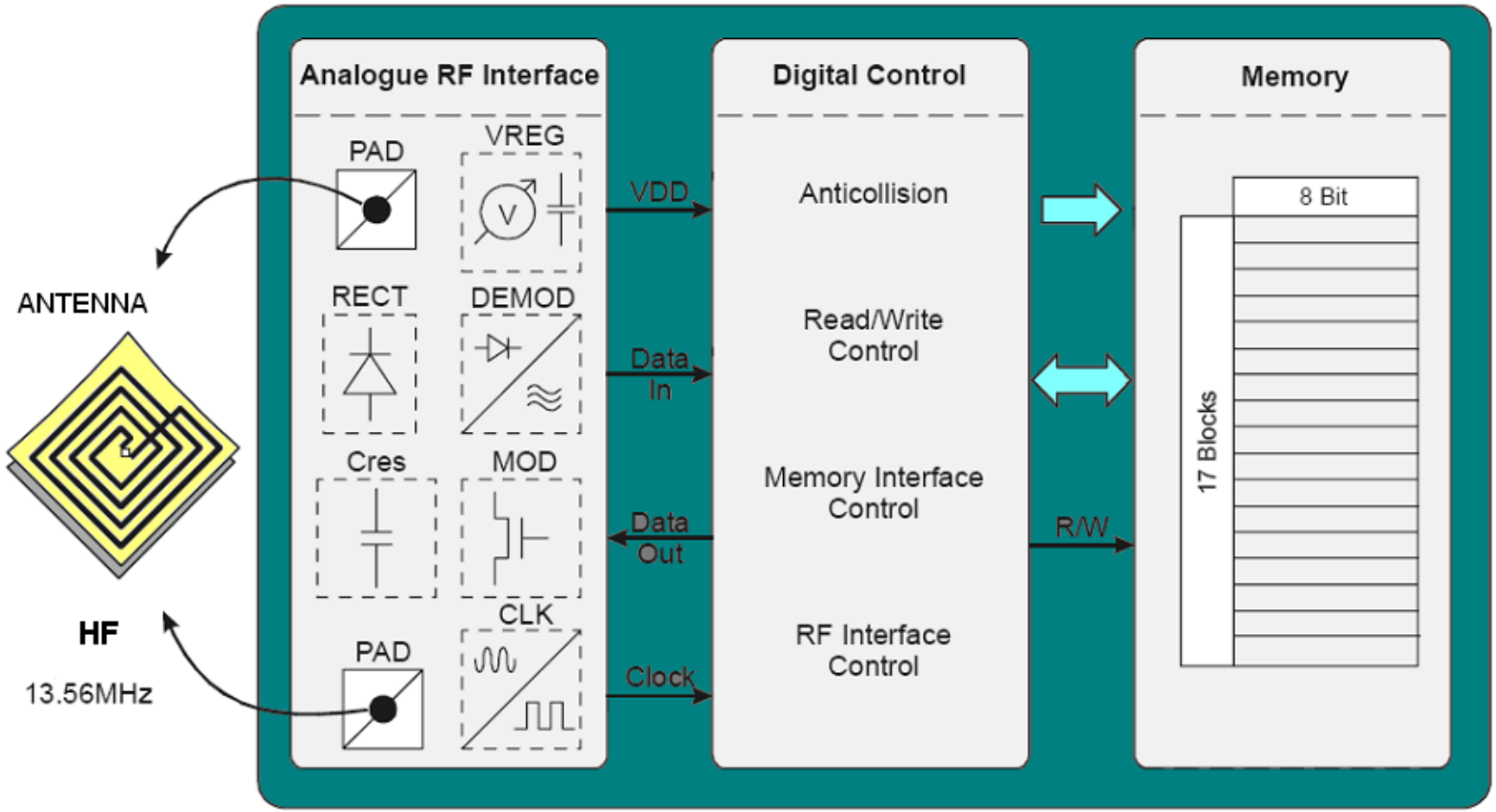
Late 1950s: IFF becomes the basis for the world's air traffic control systems

Then, we can conclude that RFID is NOT a NEW technology.

What is RFID?

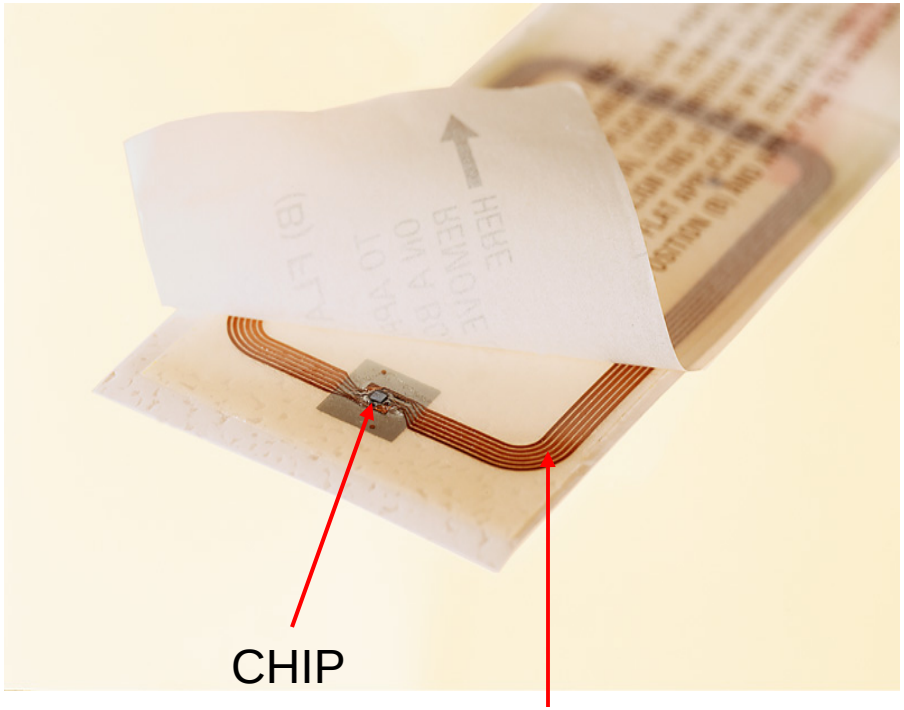
- RFID is the contracted name for **R**adio **F**requency **Id**entification.
- A technology that allows information exchange between different devices via radio frequency in a electromagnetic field.
- The data signals can be modulated in different ways and in different frequency ranges.
- RFID devices are available as Active and Passive types.
  - Active types are battery operated
  - Passive types are operated by an electromagnetic field generated by a reading device.
- Passive types are based in two elements: a **CHIP** and an Antenna.

CHIP - the heart of a passive RFID tag



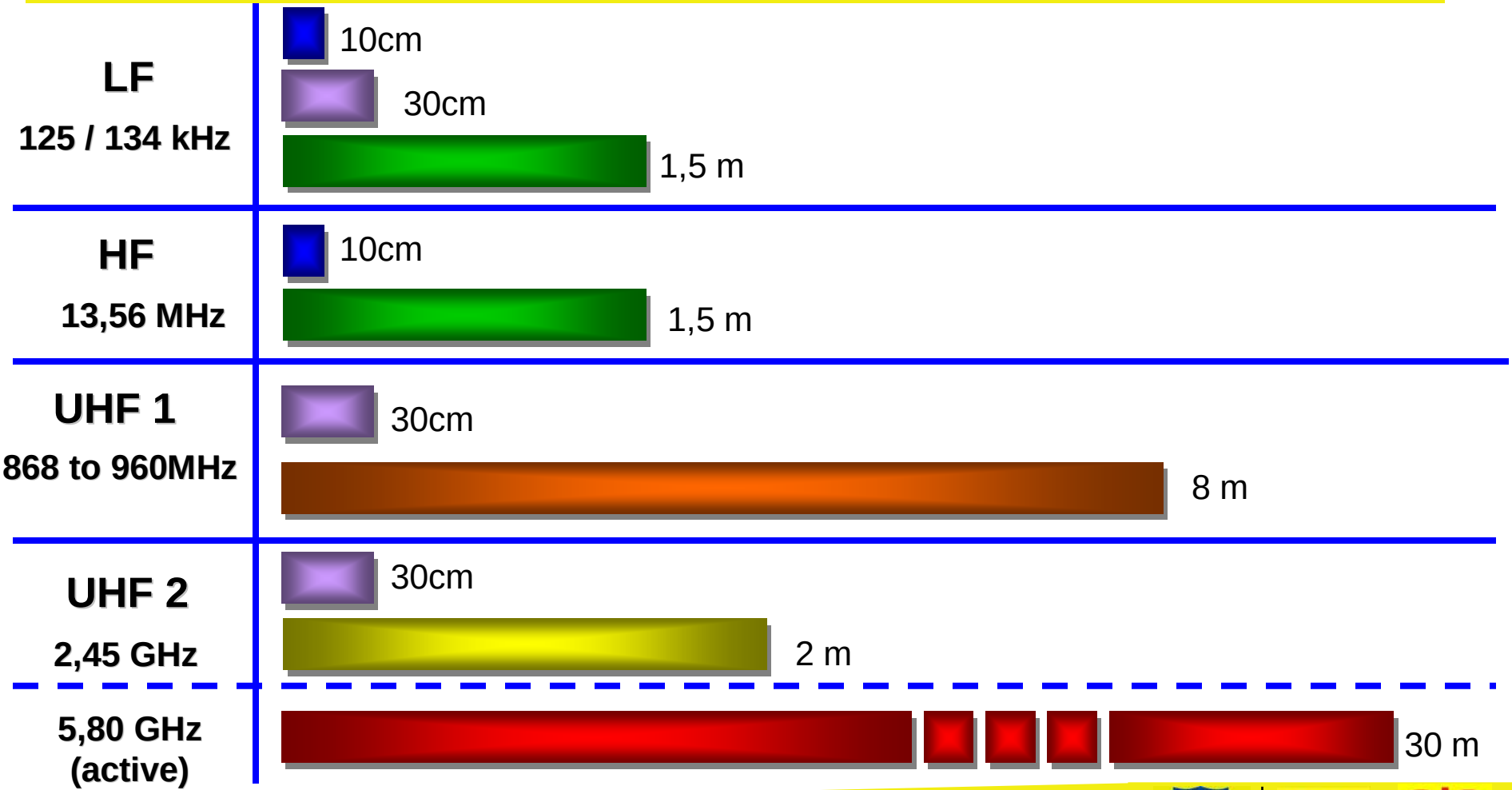
Passive RFID devices

Smart Label



Contactless Smart Card

Frequency ranges and Operating distances



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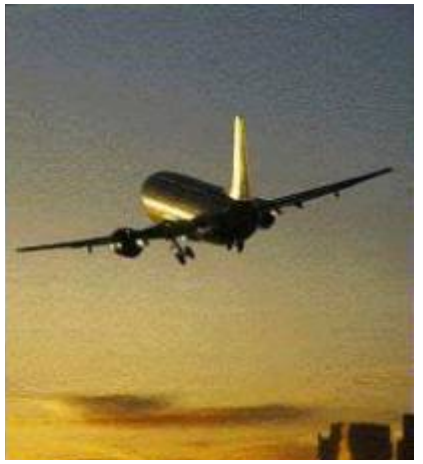
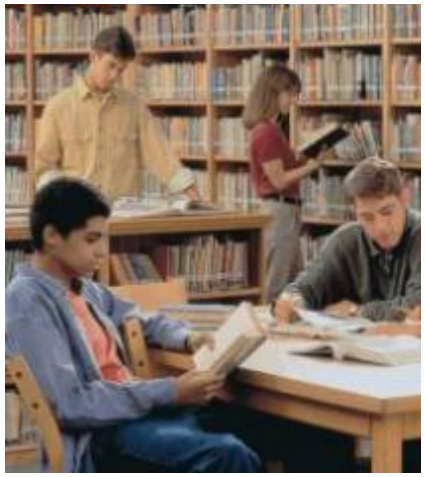
Examples of RFID applications

- Labels and Tags:
  - Supply Chain Management
  - Libraries
  - Rental
  - Event ticketing
  - Airline baggage tagging
  - Animal ID
  - Parcel & Postal services
- Cards:
  - Public Transport
  - Citizen ID or eID Card
  - Electronic Passport or ePassport
  - Health Card, Drivers License, others.





Differences between RFID devices

- CHIPS for RFID are available with different functions and characteristics.

Labels and Tags 	**Contactless Smart Cards** 
Applicable for objects and animals	Applicable for humans beings
Small memory capacity	Big memory capacity
Simple circuitry / Fixed hardware	Complex circuitry / Micro processed hardware
Limited functionalities	Unlimited functionalities
Low security level	High security level (CC EAL4+ or higher)
Simple command set	High level command set
No OS required / ISO Standard	OS is required most cases / ISO Standard

The evolution of the technology

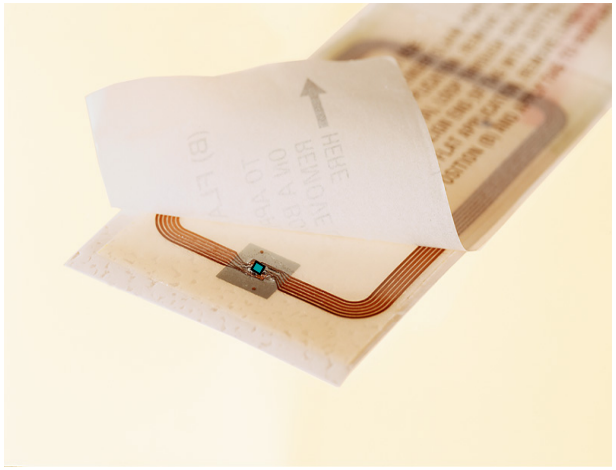
1999 ——————————— **2009** →

Analog / CDMA
Mobile phone

3G GSM
Mobile phone

The evolution of the RFID technology

1999 — **2009** →



13,56MHz
ISO15693
Smart Label

13,56MHz
ISO14443
Electronic Document

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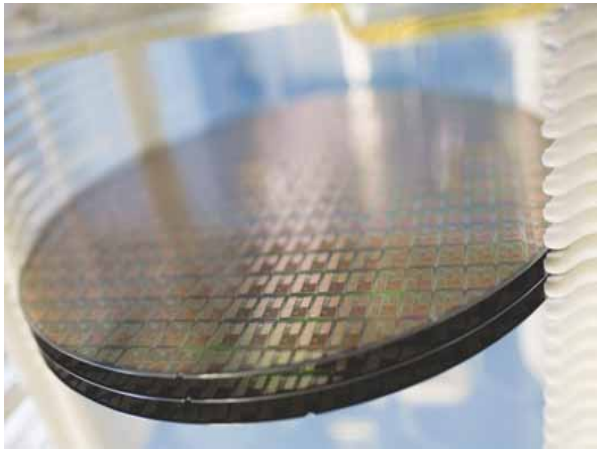
The use of RFID in documents

Electronic Documents

ePassport



Chip on Wafer

eDrivers License

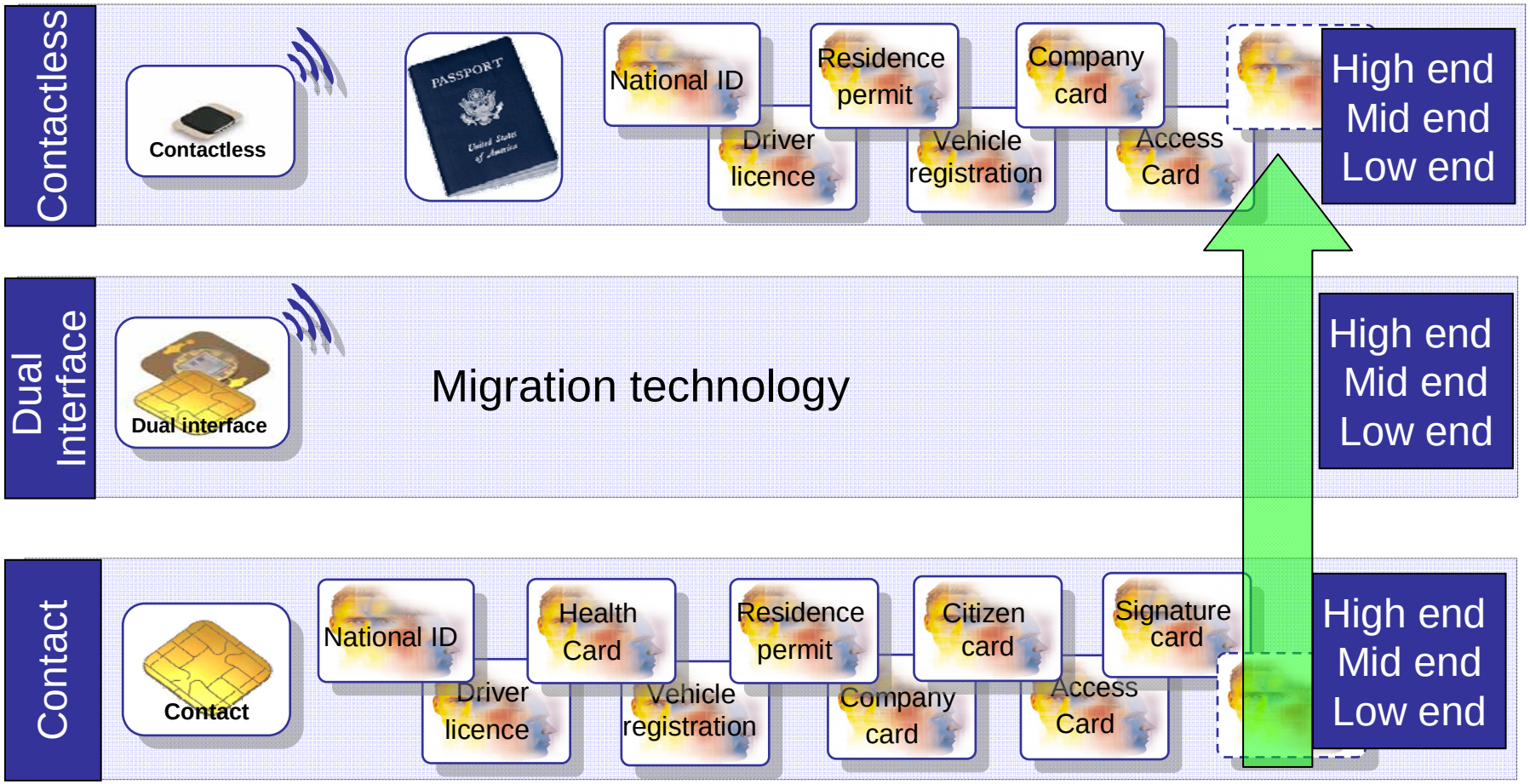
eID Card

Health Card

Electronic documents

- eID Documents
  - ePassport
  - National ID card
  - Driver license
  - Residence permits
  - Vehicle registration
- Public Service Cards
  - Health cards
  - Social security cards
  - Citizen Cards
  - Tax payer card
- Other Badges
  - Secure access control card
  - Patient ID
  - Company cards

Electronic documents per interface



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Application technology adoption

Emerging

Adoption

High Volume

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Application standards

International Standards

eGovernment
Application standards

National / regional Standards

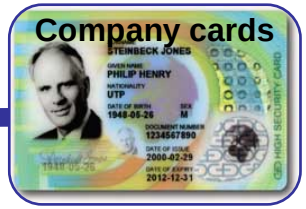
ICAO MRTD
LDS Technical report
PKI Technical report

ICAO LDS & PKI specifications also support many of the needed functions for regional applications.

National ID

Health / Social Security card


Residence permit


Company cards

Strong tendency to reuse ICAO defined LDS and access methods

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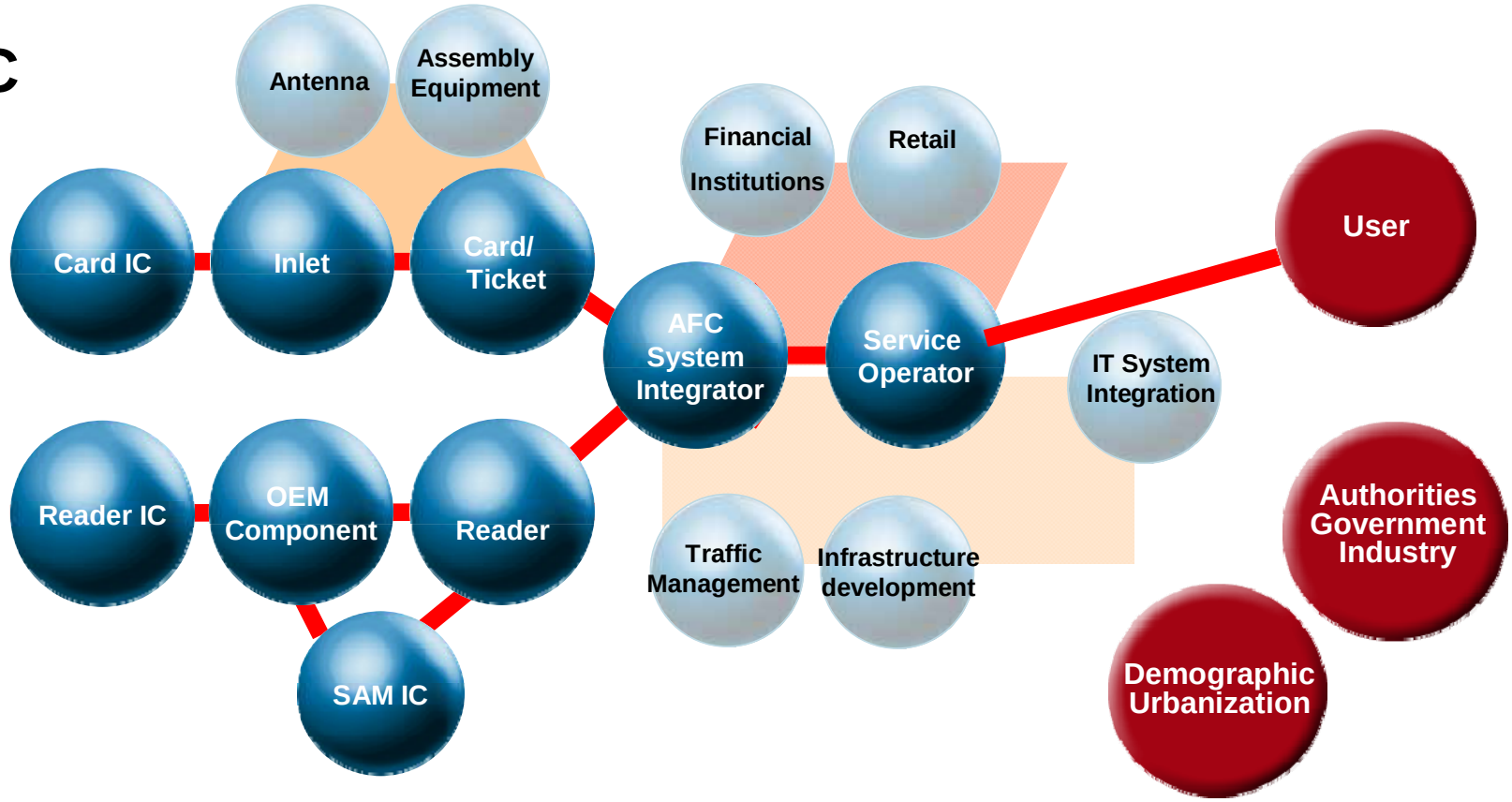
Tarjeta Ciudadana
Bogotá Capital


Tarjeta Ciudadana
Bogotá Capital

ECO System for AFC

AFC



What is mifare ?

Mifare is a family of Card and Reader ICs

- Mifare is the leading contactless interface for smart cards
- Mifare is standardised in ISO14443A (Contactless Proximity Smart Cards)
- The mifare Interface Platform is a family of Chip Card and Reader ICs.

Mifare in numbers

In 1994, first MIFARE card & reader solution

invented and launched by NXP engineers

> 650 cities
> 50 countries

Adopted MIFARE solutions

> 1,1 Billion cards
> 800Mi tickets
> 10Mi readers

distributed in the market

> 740
Card & Reader Makers; Solution Developers

registered and available at www.MIFARE.net

> 40
Application types

deployed across industry categories

>10
Breakthrough innovations

first-to-market products

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Contactless Card IC Product Portfolio

New Product

Enhanced Version

	MIFARE Ultralight MF0 U10 MF0 U11	MIFARE Ultralight C MF0 U20 MF0 U21	MIFARE Classic MF1 S20 MF1 S50 MF1 S70	MIFARE DESFire EV1 MF3 D21 MF3 D41 MF3 D81
HW Crypto	-	3DES	crypto1	3DES, AES
EEPROM	512 Bit	1536 Bit	320B, 1 KB, 4 KB	2, 4, 8 Kbyte
Special Features	-	-	-	-
Certification	-	-	-	CC EAL 4+
Contactless Interface	**ISO14443A** (13.56MHz, up to 10cm distance, 106 - 848kBaud)			
Design-In Package	**PEGODA** (CL RD701)			
Reader IC	**MFRC – Family**			

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Taking MIFARE Classic to the next phase

Taking MIFARE Classic to the next phase

MIFARE Plus

www.nxp.com
www.mifare.net

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MIFARE PLUS

- Meets customers' demand on continuously increasing security levels and high performance products.
- Supports the large heritage of MIFARE Classic installations, MIFARE Plus introduce a new security and performance benchmark in the cost sensitive contactless chip card market.
- MIFARE Plus perfectly fits into the NXP portfolio positioned between the MIFARE Classic and MIFARE DESFire products.
- Naturally, an appropriate combination of security features on the chips and in the infrastructure is necessary to ensure that the security requirements of the end-to-end system are met.

Contactless Card IC Product Portfolio

	MIFARE Ultralight MF0 U10 MF0 U11	MIFARE Ultralight C MF0 U20 MF0 U21	MIFARE Classic MF1 S20 MF1 S50 MF1 S70	MIFARE Plus MF1 S61 MF1 S71	MIFARE DESFire EV1 MF3 D21 MF3 D41 MF3 D81
HW Crypto	-	3DES	crypto1	crypto1, AES	3DES, AES
EEPROM	512 Bit	1536 Bit	320B, 1 KB, 4 KB	2, 4 Kbyte	2, 4, 8 Kbyte
Special Features	-	-	-	MIFARE Classic compatible	-
Certification	-	-	-	CC EAL 4+	CC EAL 4+
Contactless Interface	**ISO14443 A** (13.56MHz, up to 10cm distance, 106 - 848kBaud)				
Design-In Package	**PEGODA** (CL RD701)				
Reader IC	**MFRC – Family**				

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Contactless Reader IC Product Portfolio

Single Chip Reader Family

- Front end IC
- Proximity operating distance (up to 100 mm)
- Includes all RF circuitry
- Supports:
  - ✓ **MIFARE Ultra Light**
  - ✓ **MIFARE Classic (1K & 4K)**
  - ✓ **MIFARE DESFire, DESFire EV1**
  - ✓ **SmartMX (Dual Interface)**
  - ✓ **ISO 14443**
  - ✓ **ISO 15693 (CLRC632)**

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Contactless smartcard, ECP and Dual Interface

	MF RC 500	MF RC 530	MF RC 531	CL RC632	MF RC 522	MF RC 523	PN511	PN512	PN531	PN532	PN533
Operating Distance	up to 10cm										
ISO 14443 A	yes										
ISO 14443 B	-	yes			-	yes		-	yes		
ISO 15693	-	yes			-						
RF Interface	Up to 500mW				Up to 250mW						
ISO 18092 (P2P)	-				yes						
MIFARE crypto support	yes										
Higher Data rates	-	yes			Yes (up to 424kbaud)						
Controller implemented	-							yes			
MIFARE key storage	yes				-						
Host interface	8 bit parallel	8 bit parallel, SPI, 3.3 V digital supply			RS232, SPI, I²C, 3.3V digital supply		8 bit parallel, RS232, SPI, I²C		RS232, SPI, I2C, USB	RS232, SPI, I²C	RS232, USB
Housing	Pin compatible, SO 32				Pin compatible , HVQFN32		HVQFN32, HVQFN40, (PN51x pin compatible with MF RC 52x)				

Terminal | Low Cost | NFC | NFC + uC

Mifare Projects Overview

Major Projects around the Globe

Europe

- Oslo
- Bergen
- Stavanger
- Stockholm
- Turku

- Copenhagen

- London
- Liverpool

- Amsterdam
- Rotterdam

- Klagenfurt

Europe

	1k	4k	DES	UL
• Madrid			✓	
• Valencia	✓			
• Malaga	✓			
• Cadíz	✓			
• Milan	✓			
• Venice				✓
• Modena	✓			
• Lyon	✓			
• Valence	✓			
• Toulouse			✓	
• Strasbourg	✓			
• Luxemburg				✓

Europe	1k	4k	DES	UL
• Bucharest		✓		✓
• Budapest	✓			✓
• Warsaw	✓			
• Minsk	✓			
• Kiev	✓			
• Moscow	✓			✓
• Kaliningrad	✓			
• St. Petersburg	✓			
• Izmir	✓			

	1k	4k	DES	UL
North America				
• Minneapolis	✓			
• Houston	✓			
• Boston	✓			
• Seattle			✓	✓
• Guadalajara	✓			✓
• Mexico City	✓			
South America				
• São Paulo	✓	✓		
• Santiago de Chile	✓			
• Buenos Aires	✓			
• Montevideo	✓			
• Bogotá	✓			
• Quito	✓			
• Lima	✓			

	1k	4k	DES	UL
Asia				
• Beijing				
• Nanjing				
• Guangzhou				
• Seoul				
• Taipei				
Australia & NZ				
• Sydney				
• Perth				
• Auckland				
• Wellington				
• Christchurch				
South Africa				
• Johannesburg				

Others

- Czech Railways
- Norwegian Railways

Event Ticketing

- Stadiums
  - 1. FC Köln
  - Real Madrid

- Olympic Games 2000
- Soccer World Cup 2006

Access Control

- DOD
- NASA

- ADP Staff Access Badge

	1k	4k	DES	UL
Czech Railways			✓	✓
Norwegian Railways			✓	✓
Stadiums				
1. FC Köln	✓		✓	✓
Real Madrid	✓		✓	✓
Olympic Games 2000	✓			
Soccer World Cup 2006	✓			✓
DOD			✓	
NASA			✓	
ADP Staff Access Badge			✓	

Market Trends - Near Field Communication

Near Field Communication (NFC)

NFC Technology at a Glance

- Developed by NXP and Sony in October, 2002
- Short-range operating distance (up to 10 cm)
- Secure contactless technology operating at 13,56 MHz

- Standardized in ISO 18092, ECMA and ETSI
- Compatible with existing ISO 14443 contactless cards & reader infrastructure
- Reader and card mode modes possible in same device
- Device-device connectivity
- Data exchange rate up to 424kbit/sec

Main NFC Application Categories

SECURE

Card Emulation Mode

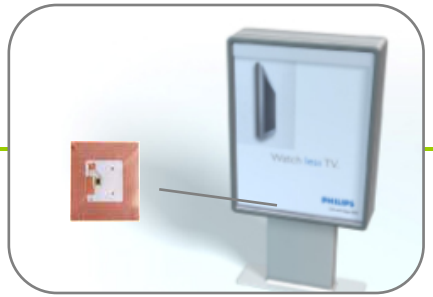
Transactions:

Mobile payment, Ticketing, Access control, Transit, Top-ups, Toll-Gate

Peer-to-Peer Communication

Connectivity:

Data transfer: Fast, easy & convenient device association, setup & configuration



Reader Mode

Service Discovery:

Content distribution, Information access, Smart advertising

NFC Applications in Mobile Phones

Transactions
Retail Payment

Transactions
public transport

Service Discovery
Take info from poster

Transactions
Micro-payments

Transactions
Access Control

Connectivity
Exchange information

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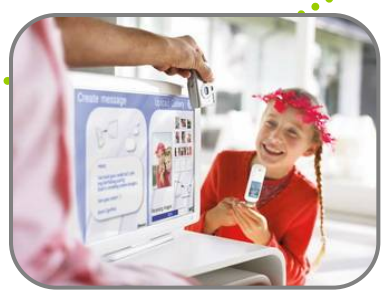
NFC Applications in Computing and CE

Connectivity
Quick and secure WLAN set-up

Transactions
Secure Payment



Connectivity
Enable quick and easy long range data transfer

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NFC enabled products

NOKIA
6131 and 3220

SAMSUNG
D500, Onyx 700 and SPH250

Motorola
SLVR L7 and IA 870

BENQ
M 700

E21

Philips NFC
monitors

Macally
NetMouse

Axia
NFC PDA

Sandisk SmartMX+Memory

Sony Erricson
HB07 and HB08

WDI SD cards

Windows OS
PHONES

Palm OS

Windows OS
PDAS

NFC
CARD

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Muchas gracias

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